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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/593,271	09/18/2006	Hidetoshi Saitoh	4991-0114PUS1	8682
2292 7590 07/09/2008 BIRCH STEWART KOLASCH & BIRCH PO BOX 747 FALLS CHURCH, VA 22040-0747				
EXAMINER				
HOBAN, MATTHEWE				
ART UNIT		PAPER NUMBER		
1793				
NOTIFICATION DATE		DELIVERY MODE		
07/09/2008		ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary

Application No.

10/593,271

Applicant(s)

SAITOH ET AL.

Examiner

Matthew E. Hoban

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 9/18/2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-946)
- 3) ☒ Information Disclosure Statement(s) (PTO/SI/ICE)
Paper No(s)/Mail Date 9/18/2006
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 11-12, and 14-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Wang in his publication entitled "Concentration quenching of Eu in SrOAl₂O₃:Eu phosphor".

Wang teaches an aluminate phosphor with a range of compositions having the formula (Sr(1-x)Eu(x))O.Al₂O₃ (x=.01-.124). These compositions are made by mixing the respective precursors, prefiring at 1000C and calcining at 1300C (See Experimental Section). In the first paragraph of the results and discussion section, it is taught that the phosphor can emit at both 415 nm and 516 nm based on the doping concentration of Eu. When there are low concentration the emission is at both wavelengths corresponding to violet (415 nm) to blue/green (516 nm). In the general formula of Wang, the value of x according to the instant claims can range between .01 and .124, where y in the formula is equal to the amount of (Sr(1-x)Eu(x))O, therefore since the integral corresponding to the strontium component is 7, then y must also be 7.

Regarding Claim 11: Wang teaches an aluminate phosphor with a range of compositions having the formula $(\text{Sr}(1-x)\text{Eu}(x))\text{O} \cdot \text{Al}_2\text{O}_3$ ($x=.01-.124$).

Regarding Claim 12: Wang teaches an aluminate phosphor $(\text{Sr}(1-x)\text{Eu}(x))\text{O} \cdot \text{Al}_2\text{O}_3$ ($x=.01-.124$), which corresponds to phosphor 7 $(\text{Sr}(1-x)\text{Eu}(x))\text{O} \cdot 7\text{Al}_2\text{O}_3$ ($x=.01-.124$), where y is 7.

Regarding 14-15: Wang teaches that the phosphor can emit at both 415 nm and 516 nm based on the doping concentration of Eu. When there are low concentration the emission is at both wavelengths corresponding to violet (415 nm) to blue/green (516 nm).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
6. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang as applied to claim 11 above, and further in view of Chen in his publication entitled "Effect of host compositions on the afterglow properties of phosphorescent strontium aluminate phosphors derived from the sol-gel method".

Wang teaches an aluminate phosphor with a range of compositions having the formula $(\text{Sr}(1-x)\text{Eu}(x))\text{O} \cdot \text{Al}_2\text{O}_3$ ($x=.01-.124$) (See Experimental Section). In the first paragraph of the results and discussion section, it is taught that the phosphor can emit at both 415 nm and 516 nm based on the doping concentration of Eu. When there are low concentration the emission is at both wavelengths corresponding to violet (415 nm) to blue/green (516 nm). In the general formula of Wang, the value of x according to the instant claims can range between .01 and .124, where y in the formula is equal to the amount of $(\text{Sr}(1-x)\text{Eu}(x))\text{O}$,

therefore since the integral corresponding to the strontium component is 7, then y must also be 7.

Wang does not teach that the y coefficient can be 12, where he only teaches y as 7.

However, Chen teaches that the ratio between strontium and aluminum can be altered to affect the afterglow properties of the composition. Chen teaches a range of ratios between Al and Sr from 1-12 and shows that the initial afterglow intensity is greatest when the ratio is between 3 and 4. Therefore, it would have been obvious to use a ratio between Al/Sr of between 3 and 4 in the invention of Wang to optimize the afterglow characteristics of the composition (See Figure 8). A ratio of between 3 and 4 relates to a y value of between 11.5 and 14, which renders the use of a y value of 12 obvious. These two references are highly combinable since they both deal with strontium aluminate phosphors.

Furthermore, one of ordinary skill in the art would find that the improvement given by Chen is highly related to the work of Wang based on this fact. One of ordinary skill in the art would thus be motivated to combine these teachings to improve the afterglow intensity of the composition of Wang.

7. Claims 16 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang as applied to claim 11 above, and further in view of Xu in his publication

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entitled " Synthesis of SrAl_2O_4 and SrAl_2O_9 via ethylenediaminetetracetic acid precursor".

Wang teaches an aluminate phosphor with a range of compositions having the formula $(\text{Sr}(1-x)\text{Eu}(x))\text{O} \cdot \text{Al}_2\text{O}_3$ ($x=.01-.124$) (See Experimental Section). In the first paragraph of the results and discussion section, it is taught that the phosphor can emit at both 415 nm and 516 nm based on the doping concentration of Eu wherein the steps of production include generally, providing precursors, prefiring, firing under reducing atmosphere, and mechanical grinding. When there are low concentration the emission is at both wavelengths corresponding to violet (415 nm) to blue/green (516 nm). In the general formula of Wang, the value of x according to the instant claims can range between .01 and .124, where y in the formula is equal to the amount of $(\text{Sr}(1-x)\text{Eu}(x))\text{O}$, therefore since the integral corresponding to the strontium component is 7, then y must also be 7.

Wang does not produce his aluminate phosphor through the EDTA.

However, Xu teaches that strontium aluminates, which he reflects are used in long-duration photoluminescence materials (as in those of Wang) can be produced through the EDTA method. In his method, which can be found in the Experimental Procedures section, the precursors are mixed in an ethylene glycol, EDTA solution, where they are complexed with the EDTA, which is an

aminocarboxylic acid-based chelating agent. After a solution is created, it is then charred and calcined at a temperature between 700 and 1400C. Xu then goes into further detail about the calcination process, where it is stated that calcining at higher temperatures, helps in crystallization and thus sharpens the Strontium-aluminum XRD peak. Xu also states that calcining in a reducing atmosphere further strengthens the crystalline peak. Therefore the process of Xu includes:

- 1) a step of producing a solution of organic metal chelate complexes including Sr and Al
- 2) pre-firing or charring of the solution
- 3) firing the powder to produce an oxide, where the firing can occur at 1400C
- 4) using a reducing atmosphere in the firing process
- 5) mechanical grinding

Although, as it was stated previously, Xu teaches the creation of the metal oxide host which is strontium and aluminum, and thus does not include the dopant of Eu, although he recognizes that this is the main use of such a host oxide. Wang teaches the use of Europium, which under the method of Xu would also be chelated if it was included in the precursor solution.

8. Claims 17-19 and 21 rejected under 35 U.S.C. 103(a) as being unpatentable over Wang in view of Xu as applied to claim 16 above, and further in view of Douy in his publication entitled Crystallisation of spray-dried amorphous precursors in SrO-Al₂O₃ system: a DSC study.

9.

Wang in view of Xu teaches a method of creating strontium aluminate phosphors of the formula $(\text{Sr}(1-x)\text{Eu}(x))\text{O} \cdot \text{Al}_2\text{O}_3$ ($x=.01-.124$). This method includes chelating the metal oxides in an EDTA solution followed by charring, and calcining under a reducing atmosphere.

Wang in view of Xu does not teach a spray drying step, where instead a pre-firing step is used and a subsequent mechanical grinding after processing.

However, Douy also teaches a method of forming a strontium aluminate, where a spray drying step is used in place of the pre-firing step (charring step) of Xu. The use of spray drying in place of this charring step would be advantageous, since spray drying creates particles, which reduces the amount of steps needed for the process of Xu. The spray drying technique makes the mechanical drying step unnecessary and also produces the same amorphous structure as the charring of the solution as in Xu (See Section 2 and 3.1-3.2). Thus one of ordinary skill in the art would find that these two steps are interchangeable. Though the solution of Douy uses nitrates, where Xu uses EDTA, the teachings of Douy are still relevant to Xu in that nitrates and EDTA perform the same purpose of solutionizing the metal ions. In sum one would be motivated to combine these references to produce a process with fewer steps.

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10. Claims 22 and 23 rejected under 35 U.S.C. 103(a) as being unpatentable over Wang in view of Xu and Douy as applied to claims 17 above, and further in view of Ono in 2001/0054708.

Wang in view of Xu and Douy teach a method of creating strontium aluminate phosphors of the formula $(\text{Sr}(1-x)\text{Eu}(x))\text{O} \cdot \text{Al}_2\text{O}_3$ ($x=.01-.124$). This method includes chelating the metal oxides in an EDTA solution followed by spray drying and calcining under a reducing atmosphere.

The above combination of references does not teach the use of a hydrogen, argon reducing atmosphere during sintering, instead using a carbonaceous one.

However, Ono teaches the use of a reducing atmosphere composed of 2 vol% hydrogen and 98 vol% argon. Therefore, reducing atmospheres of this composition are known. Furthermore, one of ordinary skill would find that the replacement of reducing gases, in this case, the carbonaceous one of Wang for the hydrogen-argon gas of Ono would be obvious. This two reducing gases are equivalent to one another and the replacement of one for the other is an obvious alteration producing no unexpected results (See Example 2).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Hoban whose telephone number is (571)

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270-3585. The examiner can normally be reached on Monday - Friday from 7:30 AM to 5 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on (571) 272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jerry A Lorengo/
Supervisory Patent Examiner, Art Unit 1793

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